The test mode may be restarted without preconditioning (begin with paragraph (c)(6) of this section).

(16) Fuel flow and air flow during the idle load condition may be determined just prior to or immediately following the dynamometer sequence, if longer times are required for accurate measurements.

(d) *Exhaust gas measurements.* (1) Measure HC, CO, CO_2, and NO_X concentration in the exhaust sample.

(2) Each analyzer range that may be used during a test mode must have the zero and span responses recorded prior to the execution of that test mode. Only the zero and span for the range(s) used to measure the emissions during a test mode are required to be recorded after the completion of the test mode.

(3) It is permissible to change filter elements between test modes.

(4) A leak check is permitted between test segments.

(5) A hangup check is permitted between test segments.

(6) If, during the emission measurement portion of a test segment, the value of the gauges downstream of the NDIR analyzer(s) *G3* or *G4* (see Figure 1 in appendix B to subpart D) differs by more than ±0.5 kPa from the pretest value, the test segment is void.

§ 89.408–96 Post-test procedures.

(a) A hangup check is recommended at the completion of the last test mode using the following procedure:

(1) Within 30 seconds introduce a zero-grade gas or room air into the sample probe or valve *V2* (see Figure 1 in appendix B to subpart D) to check the ''hangup zero'' response. Simultaneously start a time measurement.

(2) Select the lowest HC range used during the test.

(3) Within four minutes of beginning the time measurement in paragraph (a)(1) of this section, the difference between the span-zero response and the hangup zero response shall not be greater than 5.0 percent of full scale or 10 ppmC whichever is greater.

(b) Begin the analyzer span checks within 6 minutes after the completion of the last mode in the test. Record for each analyzer the zero and span response for each range used during the preceding test or test segment.

(c) If during the test, the filter element(s) were replaced or cleaned, a vacuum check must be performed per § 89.316–96(a) immediately after the span checks. If the vacuum side leak check does not meet the requirements of § 89.316–96(a), the test is void.

(d) Record the post-test data specified in § 89.405–96(f).

(e) For a valid test, the analyzer drift between the before-mode and after-mode span checks for each analyzer must meet the following requirements:

(1) The span drift (defined as the change in the difference between the zero response and the span response) must not exceed 2 percent of full-scale chart deflection for each range used.

(2) The zero response drift must not exceed 2 percent of full-scale chart deflection for each range used above 155 ppm (or ppmC) or 3 percent of full-scale chart deflection for each range below 155 ppm (or ppmC).

§ 89.409–96 Data logging.

(a) A computer or any other automatic data processing device(s) may be used as long as the system meets the requirements of this subpart.

(b) Determine from the data collection records the analyzer responses corresponding to the end of each mode.

(c) Record data at a minimum of once every 5 seconds.

(d) Determine the final value for CO_2, CO, HC, and NO_X concentrations by averaging the concentration of each point taken during the sample period for each mode.

(e) For purposes of this section, calibration data includes calibration curves, linearity curves, span-gas responses, and zero-gas responses.

§ 89.410–96 Engine test cycle.

(a) The 8-mode cycle (see Table 1 in appendix B to this subpart) shall be followed in dynamometer operation tests of compression-ignition nonroad engines.

(b) During each non-idle mode, hold the specified speed and load to within ±2 percent of point. During each idle mode, speed must be held within the manufacturer's specifications for the engine, and the throttle must be in the fully closed position and torque must